

From: [ANDERSON Jim M](#)
To: [Eric Blischke/R10/USEPA/US@EPA](#)
Subject: Re: Outline of approach to derive sediment PRGs from bird egg TRVs
Date: 03/17/2010 10:18 AM

Thanks
Jim

From: Blischke.Eric@epamail.epa.gov
To: POULSEN Mike; ANDERSON Jim M
Sent: Wed Mar 17 10:08:06 2010
Subject: Fw: Outline of approach to derive sediment PRGs from bird egg TRVs

As requested.

Eric

----- Forwarded by Eric Blischke/R10/USEPA/US on 03/17/2010 10:07 AM -----

From: Burt Shephard/R10/USEPA/US
To: Jeremy_Buck@fws.gov
Cc: Bob Dexter <bob@ridolfi.com>, Eric Blischke/R10/USEPA/US@EPA, Joe Goulet/R10/USEPA/US@EPA, Jennifer Peers <JPears@stratusconsulting.com>, peterson.jennifer@deq.state.or.us, Elizabeth Allen/R10/USEPA/US@EPA
Date: 03/17/2010 09:48 AM
Subject: Re: Outline of approach to derive sediment PRGs from bird egg TRVs

Jeremy,

I think you and I are on the same page regarding the calculation of the sediment PRG from bird egg TRVs, at least regarding the method. The example I sent out COB yesterday uses the same approach you outlined, with the additional detail of assuming the eagle diet is what we told LWG to assume in the BERA problem formulation (45% each carp and largescale sucker, 5% each northern pikeminnow and peamouth). I agree with you that eagle diets are hard to pin down given the wide variety of prey species, both aquatic and terrestrial, they can and do consume.

I back calculated the sitewide weighted mean fish prey species tissue DDE concentration, which worked out to be 134 ug/kg. Dividing the egg NOAEL TRV of 1.3 mg/kg DDE by 0.134 mg/kg gave a trophic transfer factor (same thing as what you're calling a biomagnification factor or BMF) of 42.

Using the LWG's food web modeled bird egg residue and their hazard quotients gives an estimated egg DDE level of 12.35 mg/kg or greater. Using 12.35 mg/kg as the eagle egg residue instead of the empirical 5.6 mg/kg value I used gives a BMF of 92 (12.35 / 0.134). Your proposed BMF is 79, which falls between the two extremes of the BMFs I calculated, so I think we're in the right range for fish to egg BMF. The fish to sediment BSAF can be back calculated from LWG's food web model document from last summer, so that part is easy. I didn't take the time yesterday to do the lipid and OC normalization for the BSAF, but that is merely a scale change, and shouldn't alter the final PRG appreciably.

I haven't done any other chemicals yet, nor have I played with osprey egg based PRGs, but it sounds to me as though we've got a methodology. Realistically, the bird egg PRGs will in all likelihood drive the DDE sediment PRG to background once we finalize the calculations, especially if we start with the LWG estimated egg residues from their FWM, which seem to be a little higher than the empirical Columbia River egg residue data. BTW, I pulled the empirical DDE in eagle egg residues from a poster you coauthored a few years ago. If you or Chuck Henny has any egg data more recent for

eagles, let me know.

Best regards,

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"If your experiment needs statistics to analyze the results, then you ought to have done a better experiment"

- Ernest Rutherford

From: Jeremy_Buck@fws.gov
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Cc: Eric Blischke/R10/USEPA/US@EPA, Bob Dexter <bob@ridolfi.com>, Joe Goulet/R10/USEPA/US@EPA, Jennifer Peers <JPears@stratusconsulting.com>, peterson.jennifer@deq.state.or.us
Date: 03/16/2010 06:35 PM
Subject: Re: Outline of approach to derive sediment PRGs from bird egg TRVs

Hi Burt-

I have not seen LWGs rationale against the bird egg approach, other than to say that the BMFs are variable. The most common way (and most direct) to calculate fish tissue concentrations is to just divide the TRV by the BMF to get the fish tissue concentration. Since we have site specific BMFs from the Willamette River osprey data, I think this is the most straightforward approach. Egg concentrations are representative of all of what the osprey or eagle have been eating, which is primarily fish (99% for osprey and likely 80% to 90% for eagles during the breeding season) typically within 1 mile of the nest site (some papers say 1 km). Eagles also eat some waterbirds (which also can obtain contaminated food from eating fish prey from the river) and incorporate this material into the eagle body fat, which is then deposited in egg (note that eagles have NOT been reported scavenging in this area and mammal prey is quite low in diet of Columbia River eagles, although pirating from osprey and gulls is common).

Therefore, the egg "normalizes" the diet and is an expression of what the dietary intake of the eagle or osprey is (at least for the part that matters...the egg), since we are not concerned about concentrations in the whole body or body parts of eagle or osprey.

So, the target fish concentration (value considered to be protective) based on a NOAEL or LOAEL would be as follows:

TRV in egg:

	Osprey	Eagle
DDE	1.3 ppm	3.5 ppm

PCBs	3.0 ppm	4.5 ppm
Total TEQ	100 ppt	210 ppt

BMF from fish to egg:

	Osprey	Eagle
DDE	79	79
PCBs	8	8
Total TEQ	10	10

Target Fish concentration based on bald eagles (which would protect ospreys as well as osprey TRVs are just a tad higher) NOTE: The resulting fish concentrations are in PPB and NOT PPM, this is correct):

	NOAEL/BMF	LOAEL/BMF
DDE	$1.3/79 = 16.5 \text{ ppb}$	$3.5/79 = 44 \text{ ppb}$
PCBs	$3.0/10 = 300 \text{ ppb}$	$4.5/10 = 450 \text{ ppb}$
Total TEQ	$100/10 = 10 \text{ ppt}$	$210/10 = 21 \text{ ppt}$

Using the protective target tissue concentration (NOAEL/BMF) for eagles gets you the fish prey concentration that, on average, will be protective of eagle individuals. Using the target fish concentrations (LOAEL/BMF) gets you the fish prey concentration that, on average, will be protective of the population of osprey.

Then, you can go use the target fish concentrations to the method you site below to get to a sediment concentration.

I don't have any real objections to your approach proposed below, but again I think we should use the empirical data rather than Kows (which have been reported to be highly variable per chemical and have methodology issues) as well as other estimates that will have an error associated with them.

Thanks -Jeremy

Shephard.Burt@epamail.epa.gov

03/16/2010 09:33 AM

To Jeremy_Buck@fws.gov, Blischke.Eric@epamail.epa.gov

cc Goulet.Joe@epamail.epa.gov, peterson.jennifer@deq.state.or.us, Jennifer Peers
<JPears@stratusconsulting.com>, Bob Dexter <bob@ridolfi.com>

Subject Outline of approach to derive sediment PRGs from bird egg TRVs

Jeremy,

To counter LWG saying they can't derive sediment PRGs from bird egg data, I've got a simple proposal for using the bird egg TRVs, which have units of mg/kg of chemical in the egg, as a starting point to back calculate sediment PRGs.

For the chemicals that biomagnify through a food web (PCBs, DDx, the more highly chlorinated dioxin/furan congeners), start with the bird egg TRV for each chemical of interest, then look up its log Kow value. For a mixture such as total PCB we could use an average log Kow like was done in the food web model, where we used a total PCB log Kow of 6.6.

Once you've got the log Kow, look up the food chain multiplier between trophic levels 3 and 4 in the food chain multiplier table Larry Burkhard developed for the Great Lakes water quality initiative. The bird egg TRV gets divided by the food chain multiplier to derive a fish tissue concentration that would result in accumulation of the egg TRV concentration if the eagle or osprey ate fish with that predicted chemical concentration. Once you've got the fish tissue concentration that results in accumulation of the chemical to the bird egg TRV concentration in a bird that eats fish, its a simple matter to either use the food web model or BSAFs to back calculate the sediment concentration resulting in accumulation of that fish tissue concentration. Voila, instant bird egg based sediment PRG.

One could make the approach more site specific by back calculating a site specific food chain multiplier by dividing, for example, the mean measured bird egg residue by the mean measured fish tissue concentration in the fish species that constitute the diet of eagles and osprey. The egg TRV is then divided by the site specific food chain multiplier to get the chemical concentration in fish. The back calculation from fish concentration to sediment PRG is as before.

Unless you or someone else see some problems with this approach (I've copied a few folks who may have a quick read on this as well as you), I think we should direct LWG to use it to derive bird egg based sediment PRGs for use in the feasibility study. I don't think we should accept LWG saying they can't calculate an egg based PRG when there seems to be a very straightforward approach for doing so. I wouldn't be surprised to see a DDx sediment PRG developed in this manner being one of the lowest, if not the lowest ecologically based sediment PRG for DDx, given the sensitivity of birds to egg shell thinning and its subsequent reproductive effects.

Best regards,

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